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HUMAN ENTERIC PATHOGENS IN DOGS
IN CENTRAL ALASKA: PART II

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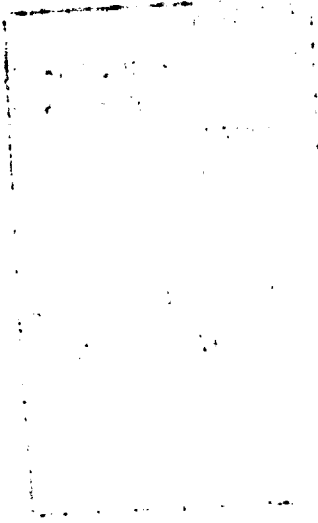
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FOREWORD

Research reported in this paper was done at the Arctic Aeromedical Laboratory, Arctic Pathoecology Branch, under Project 8241, Task 824101, from July 1965 to March 1966.

The authors wish to thank Dr. James C. Beckley, Veterinarian, Fairbanks, Alaska; Lt. Colonel Leon Johnson, Veterinarian, Fort Wainwright, Alaska; and Captain Richard C. Simmonds, DVM, USAF, Veterinarian, Arctic Aeromedical Laboratory, for their assistance and contributions to this study.

This technical report has been reviewed and is approved.


HORACE F. DRURY
Director of Research

ABSTRACT

A second year's survey of *Salmonella* and related enteric pathogens in dogs in Fairbanks, Alaska, shows that house pets within the city have a much higher incidence rate than do other groups of dogs in the area. Nine different species of *Salmonella* and four related *Enterobacteriaceae* were recovered. During the two years of study, 20 species of *Salmonella* have been recovered. Consideration of factors that constitute a dog's environment indicates that acquisition and dissemination of these pathogens are directly related to the animal's freedom of movement, particularly its access to refuse and garbage.

I

INTRODUCTION

In a study of potential reservoirs and vectors of human intestinal pathogens in Alaska (1) it was previously reported that 27% of the family pet dogs in Fairbanks, Alaska, were harboring potentially pathogenic members of the bacterial family Enterobacteriaceae, excluding Escherichia coli. In comparison, surveys of dogs in other states have shown 15.1% to be positive in Florida (2), 5.1% positive in Georgia (3) and 3.4% positive in Texas (4). Prior to the 1965 report the highest percentage recovered in Alaska dogs was 7% reported from a survey in Pt. Barrow (5).

A second year's survey was undertaken immediately following the first with several objectives in mind. The first objective was an attempt to duplicate this high rate of recovery, and the second was an attempt to determine if dogs which were in the same geographical location but were maintained in a more controlled manner also harbored this large percentage. As in the first study a close observation on the health of the animals was kept and the liaison with local State Department of Public Health Laboratory was continued so that the species recovered in human cases could be correlated with those recovered from dogs.

The high rate of recovery of this group of organisms from a single identifiable source other than human is important from a public health aspect and of interest because Fairbanks is located in a subarctic area.

In order to examine the factors or objectives, we sampled four different groups of dogs during the second survey. These four groups included 1) house pets kept within the city of Fairbanks, Alaska, 2) house pets on an adjacent military base, 3) kennel dogs in or near the city, and 4) military sentry dogs on duty in the area. Each group had distinctive factors in its environment that differed from the other groups. A generalized characteristic separation is shown in Table I.

II

METHODS

Dogs Sampled

A total of 190 samples were collected from 132 dogs. The number of cultures obtained from each group is shown in Table II. All family pet dogs from the city were cultured while the dogs were either outpatients or inpatients at the base veterinary clinic. Samples from the sentry dogs were collected either at the veterinary clinic or at their duty stations. Samples

TABLE I

Group Status of Dogs

Type of Dog	Freedom of Movement	Contact with Environment	Contact with People
House pet ^o	Unlimited	Unlimited	Unlimited
House pet ^{oo}	Relatively unlimited	Relatively unlimited	Unlimited
Kennel	Limited	Moderately limited	Moderately limited
Sentry	Extremely limited	Extremely limited	Extremely limited
^o Fairbanks	^{oo} Military Base		

TABLE II

Cultures Obtained

Type of Dog	Number of Dogs Sampled By				Total Number of Dogs Sampled
	1 Culture	2 Cultures	3 Cultures	4 Cultures	
House pet ^o	25	3	1		29
House pet ^{oo}	51	-	-	-	51
Kennel	25	-	-	-	25
Sentry	3	6	7	11	27
Totals	104	9	8	11	132
^o Fairbanks	^{oo} Military Base				

from the kennel dogs were collected at private kennels. With the exception of one kennel dog and one sentry dog, all were considered to be free from signs of an intestinal disease.

Dog Food Cultures

Samples of dog food were collected periodically from the city clinic and sentry dog supplies. Usually these samples were collected at the same time that rectal swabs were obtained from the dogs.

Sampling Techniques

All animal samples were collected by inserting a sterile cotton swab 4 to 8 cm into the rectum. The swab was placed in 0.5 ml of 1% peptone water. Inoculation to media was usually done within one hour after collection.

Cultural Techniques

Isolation and identification procedures were the same as those described by Butler and Herd (1). Particular emphasis was placed on the recovery of the organisms after enrichment in Selenite Broth (DIFCO).

The procedures as described by Galton (6) were employed for the examination of all dog food.

Confirmation of Salmonella

All Salmonella were sent to the Communicable Disease Center (CDC), Atlanta, Georgia, for confirmation. In some instances CDC had to identify the species because the authors were unable to obtain the specific antisera necessary for all species identification. Organisms other than Salmonella were identified by characteristics as described by Edwards and Ewing (7).

III

RESULTS

Answers to some of the questions raised during the first year's study were found in the results of this second survey. For example: This time 34% of the pet dogs in the city were found to be harboring human enteric pathogens; this compares to 27% during the first year. Fewer dogs in the city were sampled during the second survey but, as in the first year, positive

cultures were found each time samples were obtained from this group. Conversely, as shown in Table III, very few of the other three groups were found to be positive. In one group, family pets on the military base, no positive samples were found. This result indicates that in central Alaska maintenance and care of the animal has a definite effect on the animal's acquiring and disseminating these organisms. A summary of the species or groups is given in Table IV.

Correlative studies between species or groups recovered from human cases and those found in dogs in the area again failed to show any relationship. Four species of Salmonella including typhimurium, anatum, oranienberg and blockely were recovered from humans during the period of this second survey. Only S. oranienberg were recovered from both a dog and a human, and a relationship between the animal and human case could not be established in this instance. It appears that this lack of correlation between human and animal cases is due, for the most part, to an exiguity of human culture results. There was no shortage of human cases of gastroenteritis but there was a shortage of culture reports. The Salmonella anatum was responsible for an outbreak of gastroenteritis in students at the University of Alaska during this second survey but dogs were not incriminated or involved. An epidemiological report of this investigation is being prepared.

Some additional results were obtained from this survey. Again, the presence of the organisms in dogs appears to be transitory. As shown in Table V, replicate cultures on some of the animals showed that the organisms were not excreted for extended periods. This transitory effect has been reported by other investigators (8, 9).

TABLE V
Replicate Positive Cultures

Dog	Dates of Cultures	Results
House pet	3 February 65	No pathogens recovered
	15 February 65	<u>Salmonella cerro</u>
	July 65	<u>S. lexington</u>
House pet	3 February 65	<u>S. senftenberg</u>
	15 February 65	<u>S. minnesota</u>
		<u>S. senftenberg</u>
Sentry	April 64	<u>S. give</u>
	June 64	Bethesda-Ballerup
	September 64	Bethesda-Ballerup
	April 65	No pathogens recovered

TABLE III

Distribution of Positive Cultures

Type of Dog	Number of Dogs Sampled	Number * Positive for			Totals
		Salmonella	Shigella	Potential Pathogens	
House pet**	29	7	-	3	10
House pet***	51	-	-	-	-
Kennel	25	-	-	1	1
Sentry	27	1	-	1	2

* Each animal is counted as positive only once, regardless of the number of positive repeat cultures obtained

** Fairbanks

*** Military Base

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TABLE IV

Species or Groups Recovered

Salmonella	Group Recovered From	Related Organism	Group Recovered From
give	Sentry*	Bethesda-Ballerup	Sentry*, House pet
worthington	House pet	Arizona	House pet
senftenberg	House pet**	Alkaescens-Dispar	Kennel, Sentry
minnesota	House pet**	Hafnia	House pet
cerro	House pet+		
montevideo	House pet		
siegburg	House pet		
lexington	House pet+		
urbana	House pet		

* Same animal

** Same animal

+ Same animal

One very unusual result observed during this survey was the recovery of a Salmonella worthington in pure culture from one of the city pets. While this could be interpreted to mean that the dog was overwhelmingly infected, the animal was free of any signs of an intestinal disease. In reference to signs of disease in positive animals, this and other investigations (2, 8) indicate that very few dogs display signs of disease when this group of organisms is present. When disease signs are exhibited, however, they are usually similar to the gamut produced in humans.

All of the samples of commercial dog food were negative for enteric pathogens.

IV

DISCUSSION AND CONCLUSIONS

This second survey, in agreement with the previous one, indicates that *Salmonella* and related members of the Enterobacteriaceae family are present in a significant percentage of house pet dogs within the city of Fairbanks, Alaska. Combining the results of both years' studies it is shown that 37 of 123 pet dogs living within the city are harboring these pathogens. At the same time the organisms were found in only 1 of 100 kennel dogs, 2 of 27 sentry dogs and none of the pet dogs on the adjacent military base. It appears from these results that the city dogs have a unique factor or characteristic within their environment that would contribute toward this finding. The factors considered were food, water, soil, refuse, garbage and human contact. Geographically, the animals were all located within a small area. Through cultures, comparative studies and histories, a factor unique to the city pets was found. This was almost unlimited contact with refuse and garbage. In the city, refuse and garbage are placed in the standard garbage cans for pick-up. These containers are not animal-proof and are used as feeding stations by stray animals and family pets that are permitted to wander. The kennel dogs and sentry dogs were denied access to this source by virtue of their confinement, and on the military base all refuse and garbage are placed in large dumpsters that are animal-proof. All of the other factors considered could not be incriminated. This fact also closes the circle of transmission in this area since it means that the dog, an apparent transient reservoir, becomes an intermediate vector between humans. The actual number of cases of salmonellosis and other intestinal infections in humans in this area directly attributable to this method of dissemination is difficult to assess but there is a probability that it is much greater than in more moderate climates.

After this survey had been concluded, rectal swabs were obtained from 32 dogs at Pt. Barrow, Alaska. The specimens were taken between October 1965 and March 1966. One dog was found to be harboring a member of the

Bethesda-Ballerup group but all others were negative. None of the animals displayed signs of an intestinal disease and there has been no report of cases among the human population.

V

SUMMARY

A second year's survey of Salmonella and related enteric pathogens in dogs in Fairbanks, Alaska, shows that house pet dogs within the city have a much higher incidence rate than do other groups of dogs in the area. During the second survey nine different species of Salmonella and four related Enterobacteriaceae were recovered. A total of 20 species of Salmonella have been recovered during two years of study. A consideration of the factors that constitute a dog's environment indicates that the acquisition and dissemination of these pathogens are directly related to the animal's freedom of movement and particularly its access to refuse and garbage.

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